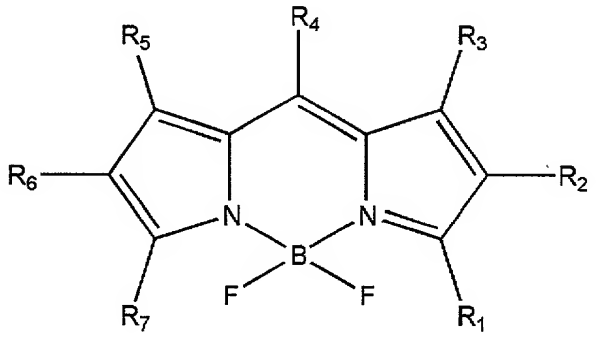
What is claimed is

1. A method of labeling poly(amino acids) comprising the steps of:

a. separating poly(amino acids) by gel electrophoresis, resulting in separated poly (amino acids);

b. transferring said separated poly(amino acids) to a solid support, resulting in immobilized poly(amino acids) ;

c. combining said immobilized poly(amino acids) on said solid support with a labeling mixture that comprises one or more chemically reactive dipyrromethene boron difluoride dyes of the formula:



wherein each of R^1 through R^7 are independently selected from the group consisting of H, halogen, L-Rx, and substituted or unsubstituted C_1-C_6 alkyl [carboxylic acid, sulfonic acid, or halogen], aryl, arylethenyl, arylbutadienyl, and heteroaryl [C_1-C_6 alkyl, C_1-C_6 perfluoroalkyl, cyano, halogen, azido, carboxylic acid, sulfonic acid, or halomethyl];

provided that one or more of R^1 through R^7 is H,

two or more of R^1 through R^7 is nonhydrogen, and

only one of R^1 through R^7 is -L-Rx, where L is a spacer having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–

nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds; and Rx is a reactive group that is a maleimide or a succinimidyl ester of a carboxylic acid; such that the dipyrrometheneboron difluoride dye has an absorption maximum between 495 nm and 640 nm;

d. incubating the immobilized poly(amino acids) in the labeling mixture for a sufficient time for the dyes to form a covalent bond with said poly(amino acids), resulting in labeled poly(amino acids).

2. A method, as claimed in Claim 1, wherein for the dipyrrometheneboron difluoride dye, Rx is a succinimidyl ester of a carboxylic acid.

3. A method, as claimed in Claim 1, wherein said solid support is made of solvent-resistant materials that are selected from the group consisting of nylon, poly(vinylidene difluoride), glass, plastics, and their derivatives.

4. A method, as claimed in Claim 3, wherein said solid support is made of materials that are poly(vinylidene difluoride) .

5. A method, as claimed in Claim 1, wherein said poly(amino acids) immobilized on said solid support has a molecular weight of 500 to-200,000 Daltons.

6. A method, as claimed in Claim 1, wherein said dye is present in the labeling mixture at a concentration of 0.10 micromolar to 10 micromolar.

7. A method, as claimed in Claim 1, wherein for the dipyrrometheneboron difluoride dye, R^1 is methyl or -L-Rx; R^2 is H, bromine, or -L-Rx; R^3 is H or methyl; R^4 is H or -L-Rx; R^5 is H, methyl, or phenyl; R^6 is H or bromine; and R^7 is methyl, phenyl, alkoxyphenyl, phenylethenyl, phenylbutatdienyl pyrrolyl, or thienyl;
where –L- is $-(CH_2)_2-$, $-(CH_2)_4-$, $-OCH_2C(O)NH(CH_2)_5-$, $-(CH_2)_2-C(O)NH(CH_2)_5-$,

$-(CH)_2C_6H_4OCH_2C(O)NH(CH_2)_5-$;

and Rx is a succinimidyl ester of a carboxylic acid.

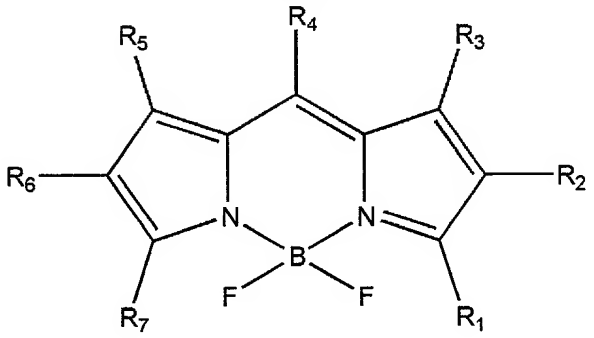
8. A method, as claimed in Claim 7, further comprising adding a specific binding pair member that contains a label and that binds selectively to a target within the immobilized poly(amino acids) that is its complementary binding pair.

9. A method of labeling poly(amino acids) bound to aptamers comprising the steps of:

a. incubating immobilized aptamers with poly(amino acids) for a sufficient time to allow said poly(amino acids) to bind to their specific aptamers, resulting in immobilized poly(amino acids);

b. removing unbound poly(amino acids) that are not immobilized,

c. combining said immobilized poly(amino acids) with a labeling mixture that comprises one or more chemically reactive dipyrromethene boron difluoride dyes of the formula:



wherein each of R^1 through R^7 are independently selected from the group consisting of H, halogen, L-Rx, and substituted or unsubstituted C_1-C_6 alkyl, aryl, arylethenyl, arylbutadienyl, and heteroaryl;

provided that one or more of R^1 through R^7 is H,

two or more of R^1 through R^7 is nonhydrogen, and

only one of R^1 through R^7 is -L-Rx, where L is a spacer having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–

nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds; and Rx is a reactive group that is a maleimide or a succinimidyl ester of a carboxylic acid; such that the dipyrromethene boron difluoride dye has an absorption maximum between 495 nm and 640 nm;

d. incubating the immobilized poly(amino acids) with the labeling mixture for a sufficient time to form a covalent bond between the dipyrromethene boron difluoride dye and said immobilized poly(amino acids), resulting in labeled poly(amino acids) that are bound to the aptamers.

10. A method, as claimed in Claim 9, wherein the dipyrromethene boron difluoride dye's chemically reactive group is a succinimidyl ester of a carboxylic acid.

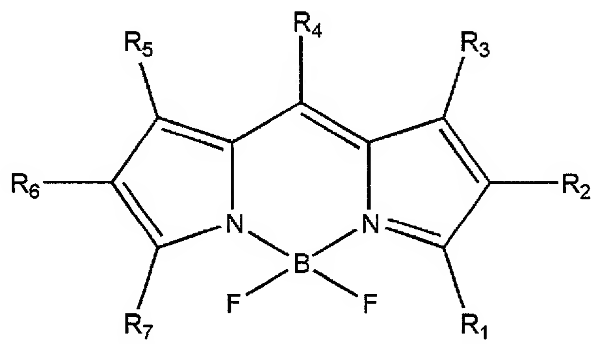
11. A method, as claimed in Claim 9, wherein said dipyrromethene boron difluoride dye is present in the combined labeling mixture at a concentration of 0.10 micromolar to 10 micromolar.

12. A method, as claimed in Claim 9, wherein for the dipyrromethene boron difluoride dye, R^1 is methyl or -L-Rx; R^2 is H, bromine, or -L-Rx; R^3 is H or methyl; R^4 is H or -L-Rx; R^5 is H, methyl, or phenyl; R^6 is H or bromine; and R^7 is methyl, phenyl, alkoxyphenyl, phenylethenyl, phenylbutatdienyl pyrrolyl, or thienyl;
where –L- is $-(CH_2)_2-$, $-(CH_2)_4-$, $-OCH_2C(O)NH(CH_2)_5-$, $-(CH_2)_2-C(O)NH(CH_2)_5-$, $-(CH)_2C_6H_4OCH_2C(O)NH(CH_2)_5-$;
and Rx is a succinimidyl ester of a carboxylic acid.

13. A method, as claimed in Claim 12, further comprising adding a specific binding pair member that contains a label and that binds selectively to a target within the immobilized poly(amino acids) that is its complementary binding pair.

14. A method of labeling immobilized poly(amino acids) in an array comprising the steps of:

a. combining an array of immobilized poly(amino acids) with a labeling mixture that comprises one or more chemically reactive dipyrrometheneboron difluoride dyes of the formula



wherein each of R^1 through R^7 are independently selected from the group consisting of H, halogen, L-Rx, and substituted or unsubstituted C_1-C_6 alkyl, aryl, arylethenyl, arylbutadienyl, and heteroaryl;
provided that one or more of R^1 through R^7 is H,
two or more of R^1 through R^7 is nonhydrogen, and
only one of R^1 through R^7 is -L-Rx, where L is a spacer having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds; and Rx is a reactive group that is a maleimide or a succinimidyl ester of a carboxylic acid; such that the dipyrrometheneboron difluoride dye has an absorption maximum between 495 nm and 640 nm;

b. incubating said array with the labeling mixture for a sufficient time to form a covalent bond between the dipyrrometheneboron difluoride dye and said immobilized poly(amino acids), resulting in the array of poly(amino acids) being labeled.

15. A method, as claimed in Claim 14, wherein for the dipyrromethene boron difluoride dye, Rx is a succinimidyl ester of a carboxylic acid.

16. A method, as claimed in Claim 14, wherein said dipyrromethene boron difluoride dye is present in the labeling mixture at a concentration of 0.10 micromolar - 10 micromolar.

17. A method, as claimed in Claim 14, wherein for the dipyrromethene boron difluoride dyes, R^1 is methyl or -L-Rx; R^2 is H, bromine, or -L-Rx; R^3 is H or methyl; R^4 is H or -L-Rx; R^5 is H, methyl, or phenyl; R^6 is H or bromine; and R^7 is methyl, phenyl, alkoxyphenyl, phenylethenyl, phenylbutatdienyl pyrrolyl, or thienyl;

where –L- is $-(CH_2)_2-$, $-(CH_2)_4-$, $-OCH_2C(O)NH(CH_2)_5-$, $-(CH_2)_2-C(O)NH(CH_2)_5-$, $-(CH)_2C_6H_4OCH_2C(O)NH(CH_2)_5-$;

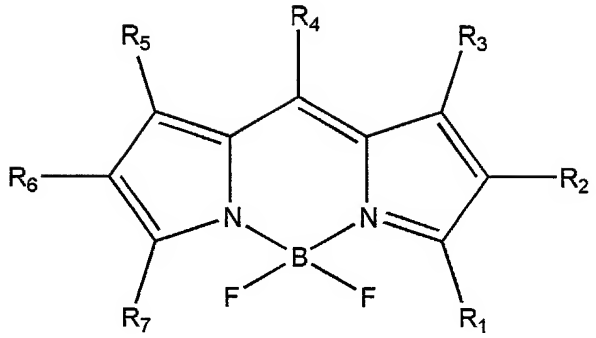
and Rx is a succinimidyl ester of a carboxylic acid.

18. A method, as claimed in Claim 17, further comprising adding specific binding pair member that contains a label and that binds selectively to a target within the immobilized poly(amino acids) that is its complementary binding pair.

19. A method, as claimed in Claim 14, further comprising adding specific binding pair member that contains a label and that binds selectively to a target within the immobilized poly(amino acids) that is its complementary binding pair.

20. A method of detecting poly(amino acids) comprising the steps of:

a. combining poly(amino acids) immobilized on a solid support; with a labeling mixture that comprises one or more chemically reactive dipyrromethene boron difluoride dyes of the formula



wherein each of R^1 through R^7 are independently selected from the group consisting of H, halogen, L-Rx, and substituted or unsubstituted C_1-C_6 alkyl, aryl, arylethenyl, arylbutadienyl, and heteroaryl;

provided that one or more of R^1 through R^7 is H,

two or more of R^1 through R^7 is nonhydrogen, and

only one of R^1 through R^7 is -L-Rx, where L is a spacer having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds; and Rx is a reactive group that is a maleimide or a succinimidyl ester of a carboxylic acid;

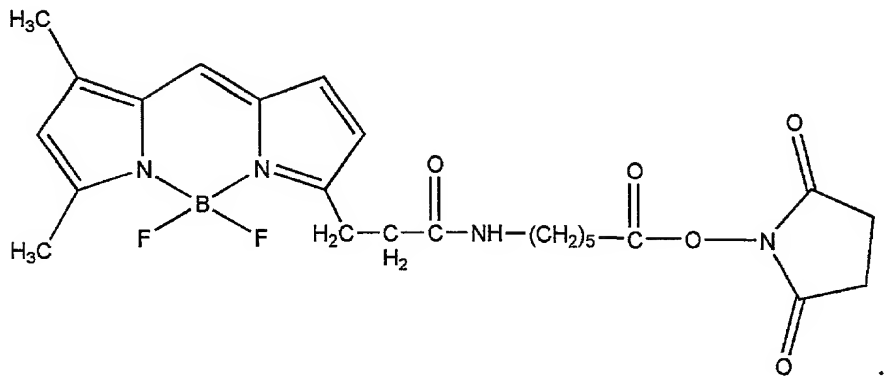
such that the dipyrromethene boron difluoride dye has an absorption maximum between 495 nm and 640 nm;

b. incubating said immobilized poly(amino acids) with the labeling mixture for a sufficient time to form a covalent bond between the dipyrromethene boron difluoride dye and said immobilized poly(amino acids) resulting in labeled poly(amino acids);

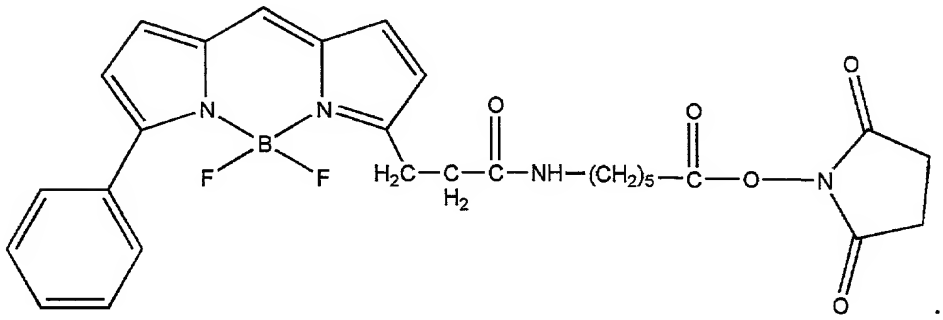
c. removing unbound dipyrromethene boron difluoride dyes ;

d. illuminating said labeled poly(amino acids) to yield a fluorescent optical response to detect the corresponding labeled poly(amino acids).

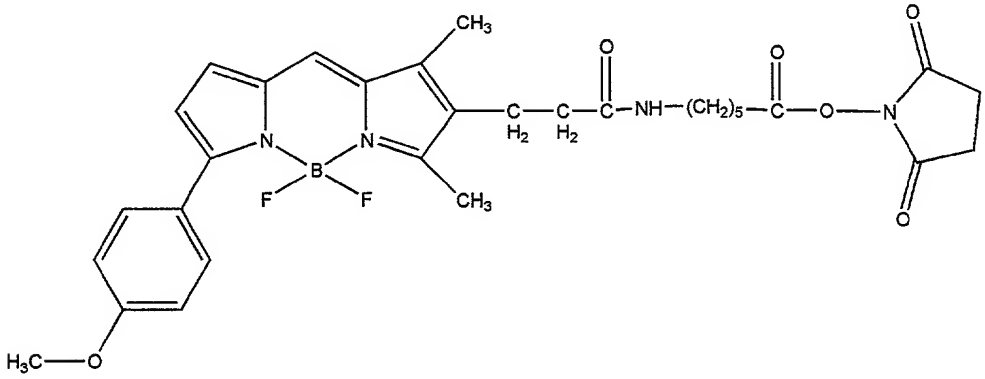
21. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



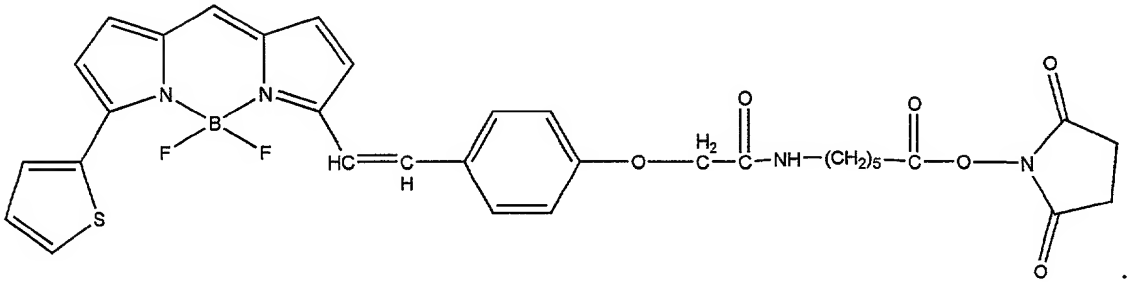
22. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



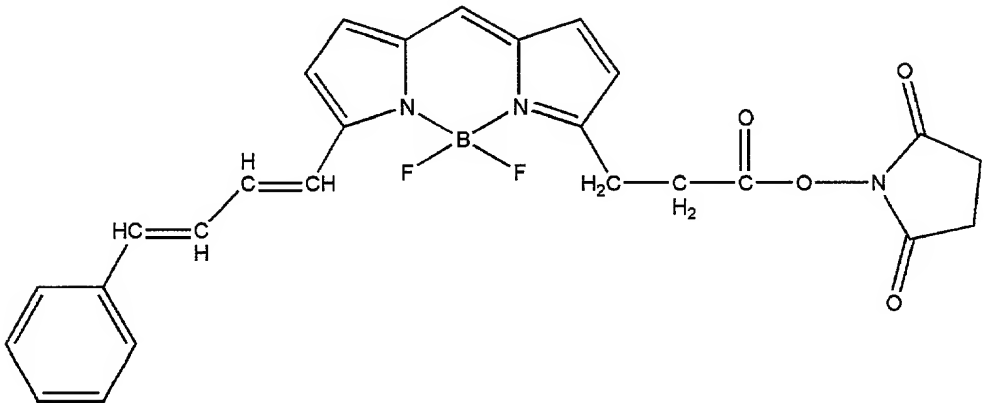
23. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



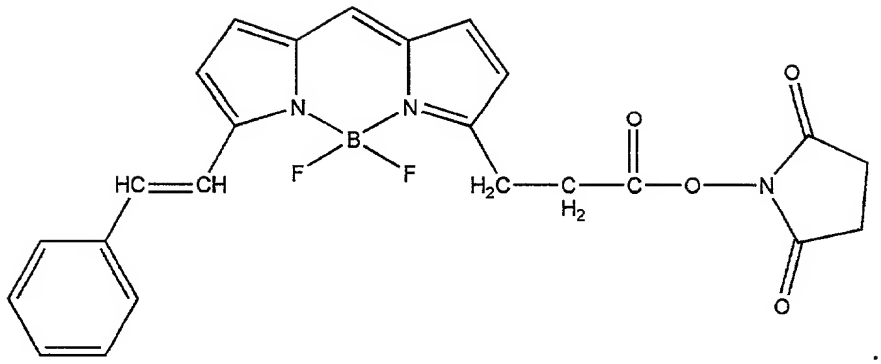
24. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



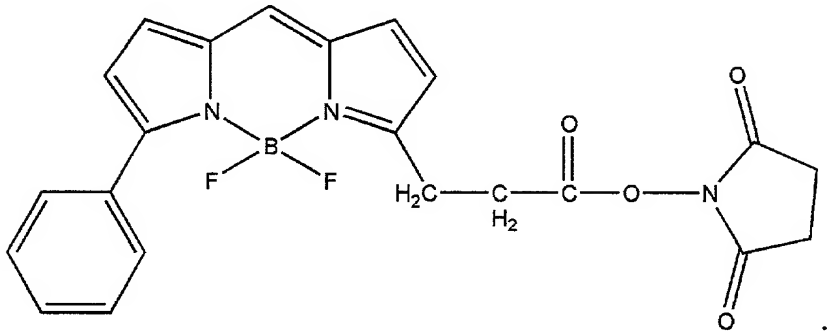
25. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



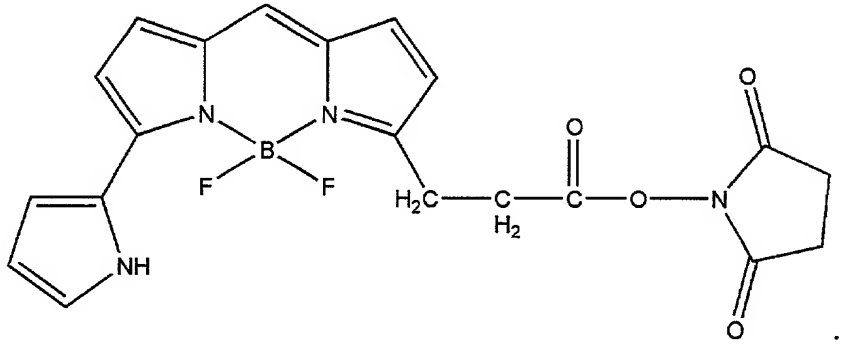
26. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



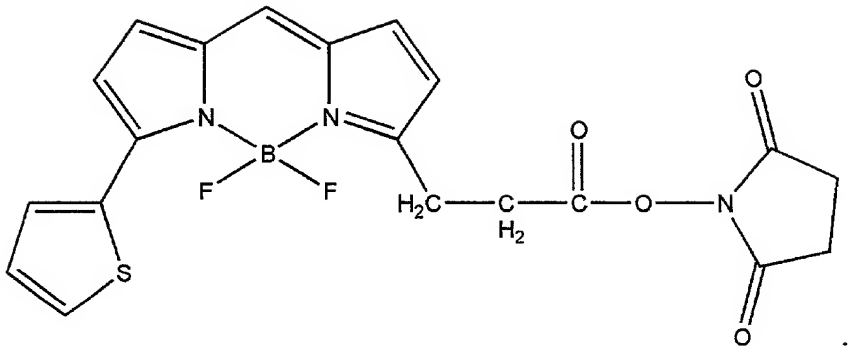
27. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



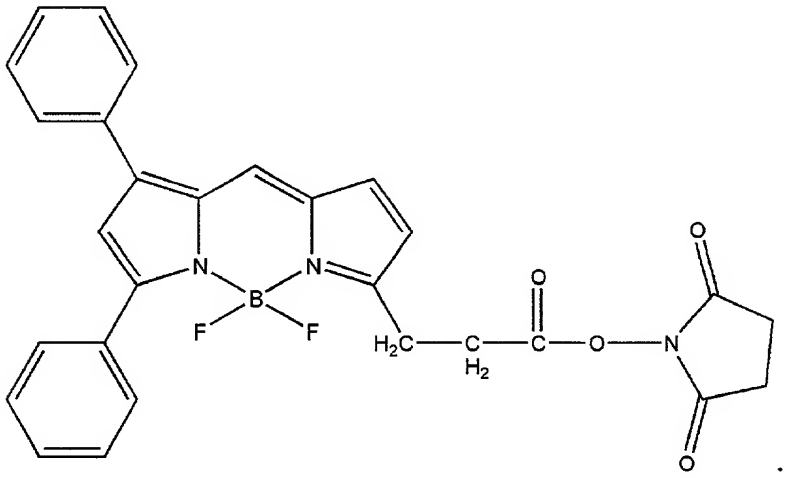
28. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



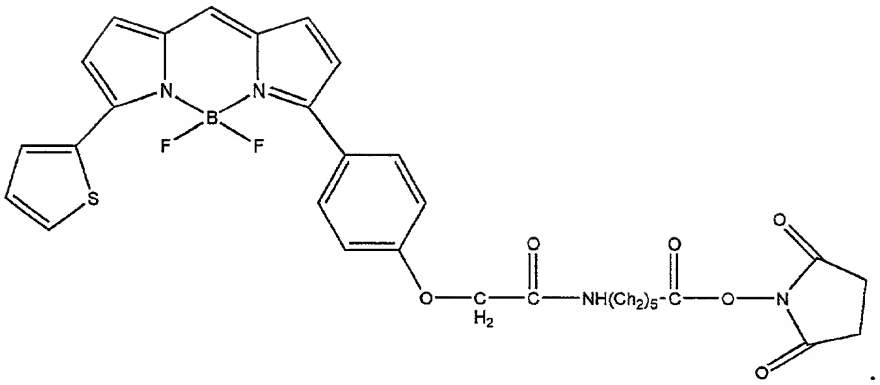
29. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



30. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



31. A method, as claimed in Claim 20, wherein the dipyrromethene boron difluoride dye has the formula:



32. A method, as claimed in Claim 20, wherein said solid support is made of solvent-resistant materials that are selected from the group consisting of nylon, poly(vinylidene difluoride), glass, plastics, and their derivatives.

33. A method, as claimed in Claim 32, wherein said solid support is made of materials that are poly(vinylidene difluoride).

34. A method, as claimed in Claim 20, wherein said poly(amino acids) on said solid support each have a molecular weight of between 500 Daltons and 200,000 Daltons.

35. A method, as claimed in Claim 20, wherein for said dipyrromethene boron difluoride dye R^1 is methyl or -L-Rx; R^2 is H, bromine, or -L-Rx; R^3 is H or methyl; R^4 is H or -L-Rx; R^5 is H, methyl, or phenyl; R^6 is H or bromine; and R^7 is methyl, phenyl, alkoxyphenyl, phenylethenyl, phenylbutatdienyl pyrrolyl, or thienyl;
where –L- is $-(CH_2)_2-$, $-(CH_2)_4-$, $-OCH_2C(O)NH(CH_2)_5-$, $-(CH_2)_2-C(O)NH(CH_2)_5-$, $-(CH)_2C_6H_4OCH_2C(O)NH(CH_2)_5-$;
and Rx is a succinimidyl ester of a carboxylic acid..

36. A method, as claimed in Claim 35, wherein said dipyrromethene boron difluoride dye is present in the labeling mixture at a concentration of 0.10 micromolar to 10 micromolar, and

wherein said labeled poly(amino acids) are illuminated for five seconds or less.

37. A method, as claimed in Claim 20, further comprising adding a specific binding pair member that selectively binds to a target within said immobilized poly(amino acids) that is its complementary binding pair.

38. A method, as claimed in Claim 37, where said specific binding pair member contains a label that is an enzyme or a hapten.

39. A method, as claimed in Claim 37, where said specific binding pair member contains a label that is a fluorophore.

40. A method, as claimed in Claim 37, further comprising:
adding a secondary complementary binding pair member that contains a label and that selectively binds to the specific binding pair member.

41. A method, as claimed in Claim 40, wherein the label on the secondary complementary binding pair is an enzyme.

42. A method, as claimed in Claim 40, wherein the label on the secondary complementary binding pair is a fluorescent dye.

43. A method, as claimed in Claim 41, wherein said enzyme is a peroxidase or a phosphatase.

44. A method, as claimed in Claim 43, wherein said peroxidase is horseradish peroxidase.

45. A method, as claimed in Claim 43 wherein said phosphatase is alkaline phosphatase.

46. A method, as claimed in Claim 41, wherein said enzyme is capable utilizing a fluorogenic substrate to generate a detectable optical response.

47. A method, as claimed in Claim 46, wherein said enzyme is a peroxidase and said fluorogenic substrate is a fluorescent tyramide.

48. A method, as claimed in Claim 46, wherein said enzyme is a phosphatase and said fluorogenic substrate is a quinazolinone phosphate.

49. A method, as claimed in Claim 46, wherein said enzyme is a phosphatase and said fluorogenic substrate is 9H-(1,3-dichloro-9,9-dimethylacridin- 2-one-7-yl) phosphate.

50. A method, as claimed in Claim 46, wherein said enzyme is a peroxidase and said fluorogenic substrate is a polyfluorinated xanthene.

51. A method, as claimed in Claim 40, wherein said secondary complimentary binding pair is an antibody or an antibody fragment.

52. A method, as claimed in Claim 39, wherein said complementary specific binding pair member is a lectin.

53. A method, as claimed in Claim 39, wherein said specific binding pair member is biotin-binding protein that contains a label.

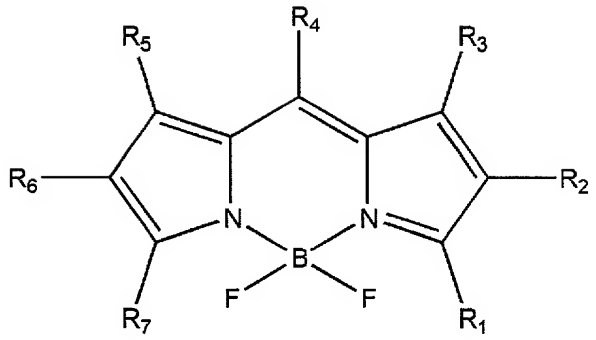
54. A method, as claimed in Claim 53, wherein said biotin-binding protein is streptavidin.

55. A method, as claimed in Claim 53, wherein said biotin-binding protein is NeutrAvidin.

56. A method, as claimed in Claim 37, wherein said specific binding pair member is an antibody or antibody fragment, an aptamer, a lectin, or a biotin-binding protein.

57. A kit for detection of poly(amino acids) immobilized on a solid surface, said kit comprising:

a. a dipyrrometheneboron difluoride dye of the formula:



wherein each of R^1 through R^7 are independently selected from the group consisting of H, halogen, L-Rx, and substituted or unsubstituted C_1-C_6 alkyl, aryl, arylethenyl, arylbutadienyl, and heteroaryl;

provided that one or more of R^1 through R^7 is H,

two or more of R^1 through R^7 is nonhydrogen, and

only one of R^1 through R^7 is -L-Rx, where L is a spacer having 1-24 nonhydrogen atoms selected from the group consisting of C, N, O, P, and S and is composed of any combination of single, double, triple or aromatic carbon–carbon bonds, carbon–nitrogen bonds, nitrogen–nitrogen bonds, carbon–oxygen bonds, carbon–sulfur bonds, phosphorus-oxygen bonds, and phosphorus-nitrogen bonds; and Rx is a reactive group that is a maleimide or a succinimidyl ester of a carboxylic acid;

such that the dipyrromethene boron difluoride dye has an absorption maximum between 495 nm and 640 nm;

b. a specific binding pair member that contains a label and that selectively binds to a target that is its complementary binding pair.

58. A kit, as claimed in Claim 57, wherein the specific binding pair member contains a label that is an enzyme; wherein said enzyme is capable utilizing a fluorogenic substrate to generate a detectable optical response, said kit further comprising the fluorogenic substrate.

59. A kit, as claimed in Claim 57, wherein said specific binding pair member is an antibody or antibody fragment.

60. A kit, as claimed in Claim 57, wherein the specific binding pair member contains a label that is a fluorescent dye.

61. A kit, as claimed in Claim 57, wherein said specific binding pair member is a biotin-binding protein.

62. A kit, as claimed in Claim 61, wherein said biotin-binding protein is avidin, Neutravidin or streptavidin.

63. A kit, as claimed in Claim 58, wherein said label is an enzyme that is a peroxidase or a phosphatase.

64. A kit, as claimed in Claim 63, wherein said peroxidase is horseradish peroxidase.

65. A kit, as claimed in Claim 64, wherein said fluorogenic substrate peroxidase substrate that is a fluorescent tyramide.

66. A kit, as claimed in Claim 63, wherein said phosphatase is alkaline phosphatase.

67. A kit, as claimed in Claim 66, wherein said fluorogenic substrate is a phosphatase substrate that is a 9H-(1,3-dichloro-9,9-dimethylacridin-2-one-7-yl) phosphate.

68. A kit, as claimed in Claim 66, wherein said fluorogenic substrate is a phosphatase substrate that is a 2-(5'-chloro- 2'-phosphoryloxyphenyl)-6-chloro- 4(3H)-quinazolinone.

69.A kit, as claimed in Claim 66, wherein said fluorogenic substrate is a phosphatase substrate that is ELF 39 reagent.

70. A kit, as claimed in Claim 58, wherein

for the dipyrromethene boron difluoride dye, R^1 is methyl or -L-Rx; R^2 is H, bromine, or -L-Rx; R^3 is H or methyl; R^4 is H or -L-Rx; R^5 is H, methyl, or phenyl; R^6 is H or bromine; and R^7 is methyl, phenyl, alkoxyphenyl, phenylethenyl, phenylbutatdienyl pyrrolyl, or thienyl; where –L- is $-(CH_2)_2-$, $-(CH_2)_4-$, $-OCH_2C(O)NH(CH_2)_5-$, $-(CH_2)_2-C(O)NH(CH_2)_5-$, $-(CH)_2C_6H_4OCH_2C(O)NH(CH_2)_5-$;
and Rx is a succinimidyl ester of a carboxylic acid;

the specific binding pair member is an antibody or a streptavidin that contains a label that is an alkaline phosphatase and the fluorogenic substrate is a 9H-(1,3-dichloro-9,9-dimethylacridin-2-one-7-yl) phosphate, a 2-(5'-chloro- 2'-phosphoryloxyphenyl)-6-chloro-4(3H)-quinazolinone, or ELF 39 reagent.